Cohen, Dippell and Everist, P.C.

Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Revitalization of the AM Radio Service	)	MB Docket No. 13-249

Comments
on Behalf of
COHEN, DIPPELL AND EVERIST, P.C.

The following comments are submitted on behalf of Cohen, Dippell and Everist, P.C. ("CDE") and is in response to the Second Further Notice of Proposed Rulemaking ("SFNPRM") released by the Federal Communications Commission ("FCC") on October 5, 2018. CDE and its predecessors have practiced before the FCC for over 75 years in broadcast and telecommunications matters. The firm or its predecessors have been located in Washington, DC since 1937 and performed professional consulting engineering services to the communication industry.

The undersigned is licensed as a Professional Engineer in the District of Columbia and has been in continuous employment with this firm or its predecessors for over fifty (50) years.

These comments offers no opinion as to the question the FCC raises with Class A daytime, critical hours or nighttime contour protection.[1]

Daytime Protection Ratio

This statement first addresses II B of the SFNPRM entitled, "Change Nighttime RSS Calculation Methodology: Change Daytime Protection to Class B, C, and D Stations." This firm

[1]No comment is offered regarding protection negotiated in various treaties with neighboring countries.

supports the pre-1991 0 dB daytime ratio for first-adjacent channels. Further support is given to Class B, C, and D stations to revise the second-adjacent normally protected contour value to be the 2.0 mV/m for both stations and eliminates the third-adjacent protection.[2]

Predicted Nighttime Interference

A further recommendation is made for all existing nighttime and future nighttime operations and is attached as Appendix A. Briefly, the FCC in the preceding paragraph of the SFNPRM requested comment on the reliability of skywave propagation. To be sure, skywave propagation is variable and the skywave propagation curves attempt to address that variability, however, it does not consider that all interfering signal paths are not identical. It is believed the current FCC methodology overstates the calculated received interference. This firm believes that is a major factor in the design of a directional nighttime antenna system and contributes to and foster deep, highly suppressed radiation patterns.

Attached hereto is a document provided and adopted by the Technical Subgroup of the Radio Advisory Committee dated May 10, 1988 which attempts to address that calculated interference overstatement.

At present, the FCC's interference criteria assumes that all interfering skywave signals

[2]One of the founding members of this firm indicated that when he was a senior engineer at the FCC, that this third-adjacent channel protection ratio was to prevent outlying stations from moving into the larger metropolitan area.

arrive at the same time as though there is 100% correlation in their propagation relationship.[3] Statistically, it is found that the number of interfering skywave signals at any one time is less than the total number of stations on the channel. For example, in the case of eight total possible events with a single probability of 0.1, the probability is:

Number of Events	Probability of Exactly X Events Occurring Simultaneously	Probability of 1 to X or Less Events Occurring Simultaneously
0	0.430	--
1	0.382	0.382
2	0.148	0.530
3	0.03	0.562
4	0.004	0.567
5	0.0004	0.567
6	0.00002	0.567
7	0.0000007	0.567
8	0.000000009	0.567

As seen from the above, the probability of eight events occurring simultaneously is far less than one.

For eight total possible events with a single probability of 0.5, the probability is:

[3]This approach gives signals the same weight as interfering groundwave signals. Moreover, it ignores the fact for 90% of the time interference from any particular station is less than that depicted by the FCC's skywave propagation criteria. This leads to inaccuracies in the estimate of service and distorts the true interference picture.

Number of Events	Probability of Exactly X Events Occurring Simultaneously	Probability of 1 to X or Less Events Occurring Simultaneously
0	0.004	--
1	0.031	0.031
2	0.110	0.141
3	0.219	0.360
4	0.273	0.633
5	0.219	0.852
6	0.109	0.961
7	0.031	0.992
8	0.003	0.995

This firm continues to believe that the above statistical relationship more accurately portrays the behavior of AM skywave signals. If true, then current rules tend to overprotect groundwave contours or, conversely, over-estimate the potential for interference.

National and Other Major Disasters

These comments also focus on other possible major catastrophic events that could arise above and beyond natural disasters. Those influences could arise by foreign intervention by a major attack on the electrical power grid. The Commission in this 'Second Further Notice of Proposed Rulemaking" by the assertion "...areas previously receiving only Class A secondary services are now served by the FM stations and smaller more local AM stations." The question arises, what method and how does the government address the national public at large if there is a successful, even temporary, catastrophic attack on the electrical grid?

Appendix B provides two recent articles concerning the potential of major disruption of the electrical power grid in the event of electromagnetic pulse ("EMP"). The first is "Air Force Study on Electromagnetic Pulse Threat" December 5, 2018[4] and the second article is "Short-circuiting the Electromagnetic Threat" May 21, 2018[5]. This does not discount a major disruption of the electrical grid by a dark cyber attack.

The Commission indicates 22 Class A stations have been equipped with backup generators and a significant number have been equipped with backup facilities that are electromagnetic pulse "EMP" resistant.

Therefore, as an alternative and preserving the ability to communicate with the general public where natural or man-made disaster areas in which Federal, State or Local officials need to address a specific need to ensure public safety is provided. The safety or communication issue can be addressed by requiring those non-Class A stations that operate on so-called Class A frequencies that opt to improve their daytime, critical hours or increase nighttime facility under the new rules should be conditioned on the construction permit and license to modify or reduce power during these extraordinary times of public need. This step will allow existing Class A stations to operate so that their signal reaches the maximum audience without the additional interference posed by the modified non-Class A operation. This approach would be similar to the exercise in prior years when Conelrad shifted frequencies nationwide to two frequencies.

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[4]Abstracted From The *"Washington Times"*

[5]Ibid.

Calculation Methodology

The process and methodology by which new AM stations or modified AM stations requests on Form 301 are submitted should be evaluated. Based on the past recent submissions, it appears that the current process strains the FCC's Media Bureau's engineering section to review the AM auction grantee or modified AM facility. The reason is that the current FCC Rules governing the allocation of AM daytime and nighttime stations are complicated by virtue of the rules being written over the past seven decades.

Therefore, it is urged that the FCC undertake an effort to develop a computerized method that would allow for an electronic submission. It is believed such a program would allow the proponent to better understand and accurately address all the technical items required. One possible computerized method is attached. The program was developed by Nick DeMinco of NTIA.

Appendix C provides a summary of the program processing elements.

Summary

CDE expresses its appreciation of the FCC's efforts to further assist the revitalization of the AM radio service.

Respectfully Submitted,

COHEN, DIPPELL AND EVERIST, P.C.

Donald G. Everist
President

DATE: February 5, 2019

APPENDIX A

ABSTRACTION FROM SUBMISSION TO THE RADIO ADVISORY COMMITTEE

TO: Technical Subgroup of Radio Advisory Committee

FROM: Donald G. Everist

SUBJECT: Mathematical Representation of Probability of 10% Skywave Signals Appearing at a Location Simultaneously

DATE: May 10, 1988

The following is a mathematical representation of the probability of multiple 10% skywave signals simultaneously appearing at a location. This document is a result of John Reiser's special effort and contribution. The following formula has been utilized:

WHERE:

p is the probability
n is the independent trials
k is "successes"
c is

For eight total possible events with a single probability of 0.1, the probability is:

Number Of Events	Probability Of Exactly X Events	Probability Of 1 to X or less Events Occurring
0	0.430	--
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8	0.003	0.995

Assumption: The eight total events are independent

APPENDIX B

Extracted from *The Washington Times*

Air Force Study on Electromagnetic Pulse Threat, December 5, 2018

Short-circuiting the Electromagnetic Threat, May 21, 2018

Air Force study on EMP threat

America's adversaries recognize that U.S. command and control systems are major targets in a conflict. If the military's ability to communicate is disrupted, then military effectiveness will be severely limited. (Associated Press/File) more >

By Bill Gertz - - *Wednesday, December 5, 2018*

U.S. military facilities involved in command and control of forces face a growing risk of disruption by an electromagnetic pulse attack or solar superstorm that could knock out all electronics at the strategic bases, according to a report.

The report by the Air Force Electromagnetic Defense Task Force, made up of civilian and military experts, also warns that EMP or geomagnetic disturbances could cause catastrophic damage and the loss of life in the United States.

"Multiple adversaries are capable of executing a strategic attack that may black out major portions of a state's grid," the report said. "An EMP attack affects all devices with solid-state electronics and could render inoperative the main grid and backup

power systems, such as on-site generators."

With heavy reliance on electronics, American society is not prepared to deal with the effects of either a nuclear weapon-caused EMP or a large solar flare that could disrupt critical electric-powered functions for months or years, the report says.

One of the key threats facing the military outlined in the report involves potential EMP attacks on command and control systems used to communicate with and direct military forces.

The report noted that flooding in 2017 at a military base incapacitated a major military command and control facility. Military mission operations were negatively affected for several days while repairs were made.

The report said America's adversaries recognize that U.S. command and control systems are major targets in a conflict. They know that if the military's ability to communicate is disrupted, then military effectiveness will be severely limited.

"In terms of strategy, from an adversary's standpoint, military installations represent the vulnerable underbelly of the defense enterprise," the report said. "In particular, if deliberate or natural EMS phenomena affect an installation's command post, the capabilities of associated forces may be degraded or stopped."

The report warned that under the right conditions "an adversary could impact the communications systems of most U.S. military installations simultaneously."

The commander of the U.S. Strategic Command, Air Force Gen. **John Hyten**, warned in 2017 that the United States is ill-prepared to deal with threats posed by an EMP attack.

"EMP is a realistic threat, and it's a credible threat." Gen. Hyten said.

The Strategic Command, which commands nuclear forces, is capable of continuing most operations after an EMP attack or solar superstorm beyond seven days. However, the command's reliance on systems that are not hardened against EMP could rapidly restrict nuclear forces. An example is aerial refueling needed to support the National Airborne Operations Center and other command and control systems could be degraded.

The report included a chart showing that the Air Force is preparing to deal with an EMP attack from a nuclear weapon detonated miles above the United States, an explosion that would cause a catastrophic power outage affecting an estimated 318

million people for 30 days.

By contrast, the Air Force sees a kinetic attack on the power grid as causing a catastrophic power outage that would affect 10 million people for two weeks, while taking three to six months to replace electrical equipment.

China's drive to become the dominant power in the advanced, high-speed 5G digital communications technology also poses risks to the U.S. military. "The states or non-states that control the 5G network will dictate or control all digital transactions including the ability to share and receive information," the report said.

"Because control of 5G is roughly equivalent to control of the internet, open 5G is critical to freedom and free-market economics," the report noted. "Meanwhile, access to the 5G-millimeter wave bandwidth will be critical to operations in all war-fighting domains, in particular, space [command and control]."

Another vulnerability for the United States involves the network of nuclear power stations, which rely on electricity to maintain cooling systems to prevent meltdowns and the release of radioactive material.

"Most experts agree that if a GMD or EMP incapacitates an electrical grid, the grid will likely remain in a failed state from weeks to months," the report said. "In turn, the ability to provide continued electrical cooling for nuclear power plant reactors and spent fuel pools would be at the top of electricity restoration priorities within hours."

Currently, however, the ability to aid distressed nuclear power stations is "very limited" and power plants have about 16 hours of backup battery power.

"In the United States, this would risk meltdowns at approximately 60 sites and 99 nuclear reactors, with more than 60,000 metric tons of spent nuclear fuel in storage pools," the report said. "Prolonged loss of power to these critical sites poses a risk of radioactive contamination to the continental United States with consequentially disastrous impact to the economy and public health."

Both to military and civilian infrastructure and hardware face risks from jet-stream winds spreading radioactive materials.

The report, published by the Air University at Maxwell Air Force Base, Alabama, in November, was written by Air Force Maj. **David Stuckenberg**, former CIA Director **R. James Woolsey** and Col. **Douglas DeMaio**.

Short-circuiting the electromagnetic threat

Illustration on the EMP threat by Linas Garsys/The Washington Times more >

By Robert R. Monroe - - *Monday, May 21, 2018*

ANALYSIS/OPINION:

Electromagnetic pulse (EMP) is a major threat to the continued existence of America. An enemy could destroy our nation simply by detonating a single nuclear weapon above the atmosphere over our country. All our enemies, including some terrorist groups, have, or can acquire, this capability. The electromagnetic pulse from this detonation would destroy our national electric power grid, and it would take many months or years to rebuild it. Without electricity, virtually all our everyday life-support systems would remain paralyzed, and millions would die of disease or starvation.

Protection from this threat would be relatively simple and affordable, but for decades our leaders have refused to take action. This is because of near-total disagreement over the threat. The tragedy is that those who support protection against EMP know

what they're talking about, and those who deny the threat don't. One would think this type of dispute would be easily resolvable. But not in this case. Here's why.

EMP was discovered — almost by accident — by our nuclear weapons scientists during the Cold War. It loomed as an immense threat, and these scientists plunged into understanding it. Everything about EMP was highly classified — at least secret, often top secret. A great many of our underground nuclear weapon tests in the 1970s and 1980s focused on EMP. They were intensively instrumented. Progressively, EMP came to be understood as a complex scientific phenomenon. But it was still highly classified, and the only individuals who had access to scientific data on EMP were government nuclear weapons scientists.

The foremost government laboratory involved was the Defense Nuclear Agency (DNA). It was America's national laboratory for nuclear weapons effects, just as Los Alamos, Livermore and Sandia were our national laboratories for nuclear weapons design. DNA's function was to ensure that America's military knew absolutely everything knowable about the many effects of nuclear weapons.

DNA employed many hundreds of nuclear scientists, detonated several underground nuclear weapon tests each year, carried out thousands of complex experiments involving nukes, and produced countless highly classified reports that were distributed to other nuclear scientists. Much of this work was focused on EMP. Its effects became are quite well understood — but only by these Cold War defense nuclear scientists. No EMP data reached anyone outside.

The Cold War ended in 1992, and many things happened. No enemies were in sight, so an undeclared nuclear freeze was established. Our leaders slashed weapons budgets and stopped all new nuclear programs. Underground nuclear testing was prohibited immediately. The United States has not conducted a test in 26 years. Advanced nuclear weapons science has been at a near standstill for a quarter-century. DNA was shut down in 1997. Most of DNA's massive library of EMP scientific data is in cold storage somewhere.

Most of the hundred-odd U.S. contractors who specialized in nuclear weapons effects shifted to other business lines or went out of business. Through laws, regulations, national policies and budget cuts, anti-nuclear activists and arms controllers essentially denuclearized the Defense Department — the only source of EMP expertise.

Today, the few retired Cold Warriors who remain are the only nuclear scientists who have designed and conducted underground nuclear EMP tests and observed the results. They know the EMP threat is immense.

In 2001, a few alert congressmen established the EMP Commission to advise the nation of the seriousness of the threat and the essential defensive actions. Congress named its nine members: The chairman, William R. Graham, is the nuclear physicist who probably knows more about EMP than any other scientist. He had just served as director of President Reagan's Office of Science and Technology Policy. The other eight members were superbly qualified through years of EMP research.

Over the past 17 years, this EMP Commission has produced many vital reports, clearly demonstrating that EMP can destroy America and kill many tens of millions, and that it can be defended against by measures which — although expensive — are well within our means.

However, during these same 17 years, a massive nationwide resistance to EMP expenditures has been orchestrated by the electric power industry and its many powerful three- or four-letter support organizations. These many thousands of important people bring their senators and congressmen (and their votes) with them. The left-wing national media, always opposed to U.S. nuclear preparedness, has spawned a cottage industry of non-experts who belittle EMP with pseudoscience, calling EMP unproven or a hoax.

Adding to the impasse, national policy for a quarter-century has prohibited the Departments of Defense and Energy from nuclear testing, so no one currently serving therein has any idea whose calculations are correct. Finally, the new Department of Homeland Security, which should be sounding the bugles for EMP defense, hasn't a clue.

With a handful of knowledgeable, 80-year-old Cold Warriors on one side, and many thousands of misinformed, powerful people on the other, is it any wonder that nothing has been done? And guess what Congress just did? It disbanded the original EMP Commission, and directed establishment of a new one.

President Trump must issue an executive order directing the government to implement the EMP Commission's long-standing recommendations on EMP defense. Failure would invite an attack.

• Robert R. Monroe, a retired U.S. Navy vice admiral, is the former director of the Defense Nuclear Agency.

APPENDIX C

SUMMARY OF INPUTS
TO THE SOFTWARE PROGRAM
DEVELOPED BY N. DEMINCO J. GEIKAS
ABSTRACTED FROM
“USER MANUAL FOR LOW AND MEDIUM FREQUENCY PROPAGATION MODEL”
AS PUBLISHED BY NATIONAL TELECOMMUNICATIONS
AND INFORMATION ADMINISTRATION
REPORT 99-368
DATED JULY 1998

The National Telecommunications and Information Administration ("NTIA") published report NTIA Report 99-368 entitled, "Medium Frequency Propagation Prediction Techniques and Antenna Modeling for Intelligent Transportation System (ITS) Broadcast Applications" and provides the equations used to develop a software evaluation ITS model authored by Nicholos DeMinco dated August 1999. From that a software program has been developed and described in the "User Manual for Low and Medium Frequency Propagation Model" by N DeMinco J Geikas dated July 1998.

A brief description of the input is as follows:

1. Ground Wave Model
    a. Smooth Earth – calculations for ground-wave field strengths assume homogeneous earth
    b. Mixed Path, Smooth Earth – calculations for ground-wave field strengths are made in sections with different ground constants
    c. Irregular Terrain, Mixed Path – uses elevation and ground constants at regular intervals to calculate field strengths (takes time to run)
2. Skywave Model
    a. FCC – Uses a curve of field strength versus distance (FCC,1982)
    b. CCIR – Uses USSR Model with modifications (Haakinson, 1988)
    c. WANG – model independent from frequency (Wang, 1985)
3. Frequency
    a. 150kHz < f <1750kHz
    b. System 1 requires a single frequency, but System 2 and 3 creates a range around the input value
4. Propagation
    a. For System 1, sky-wave predictions are made for both daytime and nighttime
    b. For Systems 2 and 3, if daytime is chosen no sky-wave predictions will be made, and if nighttime is chosen, only interfering transmitters that broadcast at night will be considered
5. Transmitter Site Parameters
    a. input coordinates (NAD 83)
6. Receiver Site Parameters
    a. For System 1, input coordinates (NAD 83)
    b. For System 2, input coordinates and radius searched around for interfering transmitters
    c. For System 3, make a boundary rectangle using longitudinal or latitudinal lines, and the distance beyond this rectangle to search for interfering transmitters
7. Required Reliability: 0 -100%
    a. The noise power is adjusted by the reliability. A 90% reliability implies that the computed signal to noise power ratio will be available for 90% of the time in a 1 hour/3 month season time block
8. Earth Radius Ratio: .5 – 3.0
    a. The ratio of the effective earth radius to the actual earth radius is used in ground-wave predictions.
    b. Using 1.33 gives a standard refractive atmosphere

9. Seasons
    a. The season chosen effects the noise variables that are included in the calculations
    b. For system 1, multiple can be selected
    c. For system 2, one must be selected
    d. System 3 is independent of the season
10. Man-Made Noise
    a. Select the type of environment of the receiver. The values give the median man-made noise in 1 Hz bandwidth at 1 MHZ. the value is adjusted for the selected frequency
    b. System 3 does not require this input
11. Time of Day
    a. This is the local time of day at the receiver, it affects the noise calculations.
    b. For system 1, multiple can be selected
    c. For system 2, one must be selected
    d. System 3 does not require this input
12. Ground Constants
    a. If "Smooth Earth" was selected, you may enter values manually or use the default values which are extracted from the database
    b. For manual input, enter a segment length, ground constant and dielectric constant for each segment you desire along a path up to a maximum of 50 segments
13. Terrain
    a. If "Irregular Terrain, Mixed Path" was selected, terrain data is necessary
    b. They all use values extracted from the database, or input manually for System 1
    c. For manual input, insert a terrain interval value (km) and then the elevation value for each interval
14. Transmitter, Receiver Antenna
    a. Vertical Monopole – the gain changed with elevation angle
        i. Antenna feed point height above ground (m)
        ii. Vertical monopole length (.01λ to.7λ)
        iii. Antenna monopole efficiency (1.00 to 100%
        iv. Ground Screen (yes or no)
            1. Ground screen radius (.01λ to.6λ)
            2. number of radials (5 – 360)
    b. Field Strength – this option allows the user to specify a fixed field strength at a fixed distance from the transmitter whose transmitter power is at a fixed reference level. The algorithm computes the equivalent antenna gain to be used in calculations.
        i. Antenna feed point height above ground (m)
        ii. Antenna field strength (mV/m)
        iii. Antenna reference power (kW)
        iv. Antenna reference distance (km)
    c. User Gain – this option allows the user to enter a fixed antenna gain relative to an isotropic that is used for all azimuths and elevations.
        i. Antenna feed point height above ground (m)
        ii. Antenna power gain relative to isotropic radiator (dBi)
    d. Ferrite Loop – this antenna is modeled to approximate the antenna found in MF receivers. The antenna is not directional and is very lossy with gains of -40 to -80 dBi typically.